February 22, 1988

To: File

From: Frank Filas, Engineer

Re: Site Inspection, M/053/003, Apex Mine

On February 19, 1988, Dave Wham and I inspected the Apex Mine. The General Manager, Tom Olsen, had prior committments and was unable to accompany us. The mill chemist, "Rocky" showed us the site but was not able to answer all of our questions completely.

The mine is relatively small (approx. 7 to 8 acres) and is located on the side of a steep hill. The mine is currently on standby while a new circuit is being added to the mill. Normally 4 to 6 miners work underground. The upper waste piles have been completely removed and transported to the mill for processing. The lower waste piles have been disturbed to a small extent. Rocky believed that the company had no further plans for any of the waste piles.

The May 3, 1984 company response to the Division's review committed to reclaiming the upper waste pile area in years 3 and 4 of the mine operation (see attached copy of response, pages 3-7). It is recommended that this work be done in the fall of 1988 if the company has no further mining plans for this area. This site will probably qualify as a small mine under the new regulations once these waste areas have been adequately reclaimed.

We also checked the bonding situation at this site. The mine is currently covered under a $54,329 collateral bond. The Division requested that this amount be increased to $59,615 in January, 1987 to cover the reclamation a newly added crushing and screening plant. St. George Mining Company has never complied with this request.

It is apparent that the crushing plant and several other bonded structures have substantial salvage value. These structures would not be included in a reclamation estimate under the newly approved bonding policy for the Mineral's Program. The existing bond amount of $54,329 appears adequate under the current bonding policy, and it is recommended that the request for additional monies be withdrawn. It is also recommended that the operator be encouraged to reclaim the old waste areas as soon as is practical.

cc: L. Braxton
D. Wham
H. Shepherd
1068R-94

Backfilling will use waste rock material that has been brought to the surface, crushed and mixed with cement, and transported pneumatically back underground. It is assumed during the planning stage that all of the waste rock will be used to backfill the mine; at the end of mining operations, no waste rock beyond what is currently present, will be left on surface. However, if the material balance changes after mining commences, and mine waste rock must be disposed of on the surface, the Division will be informed and a permit modification applied for.

Grading to remove the upper dump will be completed by the end of the second year. The lower dump area will be used during the life of the operation as a foundation pad for the mine's surface facilities. This area encompasses approximately 3.0 acres. The elevation difference from the pad surface outside the portal to the toe of the dump is only 120 feet; the dump toe extends out from the valley wall for approximately 400 feet, giving a general slope of 3.3 horizontal to 1 vertical. Grading of this lower dump area at the end of the project will establish four or five irregular benches approximately 30 feet wide along the contours, with intervening slopes of 2.5 to 1. Roads will not be graded; instead, they will be sloped to prevent them from acting as drainages. The roads will be scarified and water-barred before being revegetated.

The pre-mining contours are shown on Map SP-3, and post-mining contours and reclamation sequence on Map SP-4.

5) **Rule M-3(2)(e) - Revegetation**

The purpose of revegetation on disturbed areas at the mine will be to establish a vegetation that will stabilize the surface and to provide a suitable medium for eventual reestablishment of the native pinyon-juniper forest and associated shrubs, grasses, and forbs. The areas to be disturbed by the mine surface facilities are small--less than 10 acres--and natural seeding will take place from the surrounding vegetation.

In order to establish vegetation, several limiting factors must be overcome. The first limitation is the lack of soil and organic matter. All of the present mine facilities are planned on previously disturbed areas from which the soil has already been removed or is unavailable. The soils on these steep slopes are normally thin and skeletal, and are generally not salvageable even in undisturbed areas. The second limitation is the unstable substrate on these steep slopes. Observations on abandoned roads and building sites from previous mining indicate soil and rock rubble move downhill under gravity at a fairly rapid rate. The climate presents some problems with a hot, dry summer, low precipitation, and periodic droughts that stress vegetation.

Natural revegetation has taken place on areas disturbed from previous mining. This natural revegetation is from aggressive, colonizing, native plant species that are adapted to the conditions of unstable and rocky soils, rock outcrops, and dry, hot climate. In places such as roads and old homesteads abandoned more than 80 years ago, the native pinyon-juniper and shrub vegetation has become reestablished. On the old stable mine dumps, also abandoned about 1900, some shrubs and forbs have reestablished, although no trees are present. The mine dumps abandoned more recently do not have plants reestablished, since the slopes are very steep and eroding. This natural vegetation is encouraging in that over time and given some stability, revegetation is possible in this area. A list of plant species reestablished in various disturbances is included as Table SP-1 in this submittal.

The revegetation program presented here is designed to overcome the present limitations to establishing a rapid and viable plant cover. The revegetation methods will be tested on the upper dump area during years 3 and 4. Monitoring of these areas will continue for three years to determine success and to modify the final reclamation procedures.

TABLE SP-1

SPECIES COLONIZING PREVIOUSLY DISTURBED AREAS

APEX MINE AREA

Species	Old Road Cuts	Homesites	Bare Limestone	Mine Waste
Big Sagebrush	X		X	
Nevada Bluegrass	X		X	
Cheatgrass	X	X		
Rabbitbrush	X	X	X	X
Penstemon	X	X	X	X
Juniper	X		X	
Pinyon			X	
Cliffrose	X	X	X	X
Mountain Mahogany	X		X	X
Joint fir	X	X		X
Desert Almond		X		X
Indian Ricegrass		X		
Mallow	X			
Phlox			X	
Cactus		X		
Agave		X		
Snowberry			X	
Buckthorn				X

Revegetation will be accomplished on three types of disturbance, covering a total area of 7.7 acres:

a) Essentially bare limestone outcrop on the site of the existing upper dump - 2.4 acres;
b) The lower mine waste dump, which will be recontoured for the present surface mine facilities - 3.0 acres (this represents a refinement of earlier estimates of 3.7 acres for the facilities area); and
c) Roads and trails - 2.3 acres.

Revegetation will be accomplished using the following procedures:

a) The area to be reclaimed will be graded and stabilized. Grading on the upper dump will remove the previous mine waste only, down to the original limestone outcrop surface. Due to the outcrop pattern of the layered limestone, the slope will then have irregular benches up to 10 feet wide, separated by steep slopes. Because of the dip of the rock layering, these benches will slope slightly back into the hill. There will be no soil left on this surface, but a thin veneer of mine waste may remain in places. Drainage off this slope will be allowed to remain diffuse, rather than channeled, in order to reduce erosion. Erodable areas will be mechanically stabilized using stakes and matting where necessary. The lower dump area where the facilities are located will be irregularly benched as described previously.

b) Areas to be revegetated will be mulched and fertilized. Mulch consisting of hay will be hand-strewn on small, steep, upper areas after the dump is removed and the slope stabilized. The rate of mulching required will be visually estimated during

application to provide a good cover. Following mulching, the areas will be fertilized and seeded by hand. The rate of fertilization will be adjusted to account for bare areas and thin material, but will not exceed 150 pounds/acre. Seeds will be hand broadcast at the following rate:

Species	Common Name	Lbs/Acre
Poa nevadensis	Nevada bluegrass	10
Oryzopsis hymenoides	Indian ricegrass	8
Sitanion hystrix	Squirreltail	8
Artemesia tridentata	Big sagebrush	2
Chrysothamnus nauseosus	Rabbitbrush	2
Sphaeralcea ambigua	Mallow	2
	Total	32

Seeds for the initial revegetation activity on the upper mine dump site will come from commercially-available sources in order to have a sufficient quantity and an assured supply. However, the plant species on the project site have successfully colonized previous mine disturbances and are adapted to local conditions. Seeds will be collected from plants in the vicinity of the mine and used for reseeding in subsequent revegetation efforts. The upper mine dump site will be used to test the effectiveness of reseeding using plant species from the area, and to evaluate the application technique. The site will be monitored for species that can rapidly revegetate on-site. As mentioned earlier, natural reseeding will also take place, and these species will also be monitored to determine their suitability for inclusion in the final reclamation and revegetation plans.

c) Protection from grazing should not be necessary since domestic animals do not graze the site, due to steepness and lack of water. A thorough examination of the area for deer signs and browsing of shrubs indicates that deer are infrequent in the mine area and do not use the site for long periods during the year.

d) An area on the abandoned access road just above the fork with the present access road has been designated a soils stockpile area. It is not anticipated that a large quantity of topsoil will be available; however, any topsoil encountered will be stored here for later reclamation. The small amount of topsoil from the security area and leach pad will be stored at this location. The topsoil will be seeded with an appropriate seed mixture for a rapid vegetation cover to prevent erosion.

6) **Rule M-5 - Surety, Reclamation, & Revegetation Cost Estimates**

In our discussions, you indicated the Division will adjust the reclamation cost estimates using the recent Means Site Cost Index and Rental Rate Blue Book. The estimated cost for revegetation for 7.7 acres is:

Materials		
Mulch (hay)	2 tons/acre	$ 120/acre @ $3.00/bale
Fertilizer	150 lbs/acre	$ 14/acre
Seed mix	32 lbs/acre	$ 672/acre @ $21/lb
		$ 806/acre
	for 7.7 acres	$6,206
Matting	1,000 ft^2	$ 250 @ $.21/$ft^2$
	Materials Total	$6,456